

# Kantronics Inc.

## Version 8.3 Firmware Update For KPC-3 Plus

### User's Guide.

*Note: This document is an addendum to the User's Guide for the Kantronics KPC-3 Plus version 8.2. Not applicable for the KPC-9612 Plus, KAM Plus, or any other Kantronics modems.*

*Note: Application notes are appended at the back of this document.*

Information in this document is subject to change without notice.

We solicit your comments and corrections regarding this manual addendum. Please send them to Kantronics Co., Inc., 1202 East 23 Street, Lawrence, KS 66046.

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The version 8.3 firmware is manufactured in the U.S.A. Printed in the United States of America

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# Installation

*Note: Remember to save command parameters before installing the new chip if you wish to do so.*

*Be sure to ground yourself before handling the upgrade memory chip. Also ensure that power to the unit is disconnected*

To install the firmware chip, follow these instructions:

- 1) Remove the TNC cover.
- 2) Locate the old EPROM--it's the chip with the copyright sticker on it.
- 3) Note orientation of the chip, and remove it.
- 4) Put the new one in its place, using the same orientation of the old chip.
- 5) Do a hard reset (as detailed in your KPC-3 Plus User's Guide), and you're ready to go.

## New features

Version 8.3 Firmware, released specifically for the KPC-3 Plus on July 15, 1998, is an update to the 8.2 firmware released for all KPCs in October 1997. The 8.3 firmware update, resulting primarily from requests made by GPS and APRS users and coders, contains the following new features:

- A second serial input port for a GPS unit, using a firmware UART
- APRS "Hot Key" operation allowing APRS@ control of beaconing
- Digipeating of UI frames only
- MUTE line for voice repeaters receiving packets for retransmission
- Automatic year 2000 date stamping
- Capability of clearing LT buffers automatically after transmission
- More accurate location data via differential GPS operation
- Refinements or more options in setting the TNC clock, based on GPS NMEA string data

The second serial input port is added to accommodate the direct attachment of a GPS unit while a portable computer--featuring just a single serial port--connects to the TNC's main serial port. In this configuration, the GPS unit and TNC may work alone or in conjunction with the computer, automatically. The firmware also supports use of the APRS "Hot Key" (control-E), so that the APRS program may obtain location fix information and control beaconing.

Version 8.3 enables the restriction of digipeating UI frames only. Version 8.2 firmware featured the addition of a number of special forms of UI digipeating--mostly to accommodate digipeating with generic call signs. It did not, however, restrict normal digipeating using MYCALL, MYNODE, or MYALIAS. Normal digipeating may now be restricted, enabling an APRS network to be purely "APRS"--that is, the TNC may be configured to restrict digipeating of connected packets.

One of the output control lines may be used to mute the output of a voice repeater when packets are received on its input frequency. This enables GPS and APRS communities to share the repeater input resources with the voice community but restrict output to "voice only" operation. The control line output is active low. The installer must determine how to use this line to mute his or her voice repeater output. The packets are muted and hence not heard. Groups using the repeater in this way generally digipeat on a second GPS or APRS frequency.

Finally, the 8.3 firmware is set to accommodate the year 2000 changeover. Even without this change, the DAYSTR command (with earlier versions of firmware) may be used to format the "20" in 2000, thus providing a manual way of accommodating the changeover when it comes.

# New and Modified Commands

## **BLT n {EVERY | AFTER} hh:mm:ss [START hh:mm:ss] [CLEAR]**

default = EVERY 00:00:00 (for each of the 4 LT strings)

*This modification adds the "CLEAR" parameter to the BLT command. If CLEAR is specified, the LT buffer is cleared after transmission.*

The effect of this modification is that no copies of the NMEA string in the LT buffer are repeated.

## **CTRL [AIB] {OFF | ON | LONG | n | MUTE m}**

default as an immediate command

*This modification adds the "MUTE" parameter to the GTRL command.*

With MUTE, the control line can be used to mute voice repeater outputs. This parameter is saved in battery backed RAM. When MUTE is specified, the output control line will be a filtered version of the RCV led, with about a  $10^*m$  msec attack time. If the RCV led is active for m consecutive samples at 10 msec intervals, the CTRL line will activate; if the RCV led is off at any sample, the CTRL line will open.

## **DAYSTRING**

default = mm/dd/yyyy hh:mm:ss (Note: This command is used to set the format for time and date stamping. The actual date and time are entered by using the DAYTIME command.)

*This modification was added to accommodate the year 2000 four-digit read-out.*

The 'yyyy' format parameter has been added. If the two byte year (yy) is equal to 80 through 99, 'yyyy' will allow the DAYTIME command to output 1980 through 1999; if the two byte year is equal to 00 through 79, 'yyyy' will output 2000 through 2079.

## **DIGIPEAT {OFF | ON | UIONLY}**

default = ON

*This modification adds the "UIONLY" parameter to the DIGIPEAT command.*

The UIONLY parameter has been added to DIGIPEAT command. If UIONLY is selected, the KPC-3 Plus will digipeat UI frames only. (DIGIPEAT affects only MYCALL, MYNODE, and MY ALIAS).

## **GPSPORT [baud] [NORMAL | INVERTED] [CHECKSUM | NOCHECK]**

default = 0 NORMAL CHECKSUM

*This new command allows for the second serial input port for a GPS unit, using a firmware UART.*

If 'baud' is non-zero, the XCD pin in the radio port can be used as a GPS input during regular operation of the KPC-3 Plus. 'baud' may be set to 0, 300, 600, 1200, 2400, or 4800. If NORMAL is specified, the sense (polarity) of the XCD pin is RS232; the XCD pin would be expecting RS232 input or 0-5v input of the same polarity. If INVERTED is specified, the XCD pin would be expecting polarity opposite of RS232. Most standalone GPS units use RS232 or 0-5v output of the same polarity. If CHECKSUM is specified, the firmware will pass along only GPS sentences which have valid checksums. The NOCHECK parameter will pass along all GPS sentences which have valid checksums and also GPS sentences which do not have a checksum. Not all GPS units will append checksums to the GPS sentences that they send; some GPS sentences require a checksum while others do not.

If you wish to use the GPSPORT, note that the KPC-3 Plus cannot send any initialization string to the

GPS unit; you must pre-initialize the GPS unit before connecting it up to the XCD pin.

NOTE: The GPSPORT is a firmware UART. Although the KPC-3 Plus was tested and found to accept GPS data without error at 4800 bps while the KPC-3 Plus was idle, it would get some errors if the KPC-3 Plus was active sending and receiving packets and communicating over the RS232 port. Tests found that few if any errors occurred when 'baud' was set to 2400. For best results, set 'baud' as low as possible for your application; if you need to set 'baud' to 4800, you should also use the CHECKSUM parameter to discard errors.

NOTE: When GPSPORT is zero (0), the XCD input reverts to its original function, inhibiting PTT. If the INTFACE command is set to GPS, the TNC assumes that the GPS device is attached to the normal RS-232 port and not the secondary serial input. If INTFACE is set to KISS, XKISS, GPS, or MODEM, you should set GPSPORT to zero.

## **GPSTIME {OFF | VALID | ON} {GGA | GLL | RMC | ZDA }**

default = VALID RMC

*This new command is used to specify how the KPC-3 Plus clock will be set from the GPS device.*

If GPSTIME is set to OFF, the TNC software clock is not set when NMEA strings are received. If set to VALID, the clock is set but only if the valid bit in the string specified is set. If set to ON, the time is acquired from the string specified.

Note: .1) In any event, any string must have a valid checksum.2) Time is not updated –if the time received in a string is the same as the last time received. 3) GGA and GLL strings do not include a date; the ZDA string does not include a "valid bit:" and some units do not include a valid bit with the GLL string.

## **LGETCHAR \$xx**

default \$05 (hex, control-E)

*This new command allows the user to specify a Hot Key to perform the same function as "LT RESTART"*

LGETCHR specifies a hot key functional in command or converse mode to output the unformatted strings (to the RS-232 port) from the LTEXT buffers.

## **LT {n [text] | RESTART}**

immediate command

*This modification adds "RESTART" to the LT command.*

The RESTART parameter has been added to the LT command. When the command 'LT RESTART' is executed, the LT buffers are output in an unformatted manner via the RS-232 port, and the BLT timers are restarted. "Unformatted" means that only non-empty LT strings are output and that there is no preceding number indicating which strings are output.

## **MYDGPS call**

default = blank

*This new command allows the user to determine more accurate location data than was possible with the previous firmware.*

This command is added to accommodate differential GPS operation. In GPS mode only, if a UI packet is received addressed to the call in MYDGPS, the data from the UI packet is output on the RS-232 port.

# Using A Second Serial Port in the KPC-3 Plus for GPS/APRS

Phil Anderson, W0XI

A second serial port, configured in firmware, has been added to the KPC-3 Plus with firmware update 8.3. At present, this feature is included only in the firmware for the KPC-3 Plus and the just released KAM '98 HF/VHF modem. This second read-only port accepts NMEA strings from most GPS portables, and frees up the KPC-3 Plus RS-232 standard serial port for connection to a laptop. This configuration eliminates the need for a special cable to accommodate the sharing of the KPC-3 Plus serial port between a GPS device and a computer.

With this second port, the KPC-3 Plus can be configured as part of a GPS tracker--GPS device, TNC, and transceiver-and at the same time automatically accommodate the attachment of a computer for sending and receiving packet data. For example, the KPC-3 Plus with GPS device attached to the second serial port will allow a program such as APRS to take control of transmitting fix locations via UI frames. This may be handy when a driver wishes to add his or her computer to a tracker already operating in his or her vehicle.

When the second serial port is activated, using the GPSPORT command, the NMEA data input must be cabled to the radio port of the modem, *not* the RS-232 serial port. Since this pin is normally used for external carrier detect, carrier detect must not be configured as EXTERNAL (using the CD command). Software carrier detect is preferred, since it allows for continuous open squelch operation and for the reception of weak signals (by opening the radio's squelch completely).

Wiring to the radio port is straightforward: simply attach the two wires coming from the GPS device to the radio port cable connector. Wire the NMEA+ wire to pin 2 and the NMEA wire to pin 6, ground (of the DB-9 connector). In effect, you create a "Y" cable coming from the TNC, one portion going to the GPS data input "jack, and the other portion going to the radio.

The KPC-3 Plus is configured for GPS tracker operation in the normal manner, as outlined in the Modes of Operation section of the User's Guide. When using the second port for attachment of the GPS device, the only setup change required is to turn on and configure this port, using the GPSPORT command. The GPSPORT command allows you to configure a baud rate of 300, 600, 1200, 2400, or 4800 for the GPS device, use normal or inverted data, and use or not use checksums sent by some NMEA strings. If GPSPORT is set to a baud rate of "0," then the port is disabled.

## **Example: Setting up a tracker using the Magellan Meridian XL GPS unit and the 8.3 KPC-3 Plus**

I set up the modern parameters for GPS operation in the usual manner:

GPSHEAD 1 \$GPRMC

LTP 1 GPS VIA RELAY, WIDE (Check with your local GPS group for the preferred beacon path)

BLT 1 EVERY 00:10:00 CLEAR

LTRACK 5 LT1 TIME

GPSTIME VALID RMC

MONITOR ON

I then configured the GPSPORT for 4800 baud operation, normal signaling, and to check data input using checksums:

GPSPORT 4800 NORMAL CHECKSUM

These commands completed the configuration of the KPC-3 Plus as a tracker with the GPS device attached to the radio port's input-only serial port. Note that *I did not have to change the interface command (INTface) to GPS* since the GPS device is not attached to the RS-232 port in this tracker configuration.

## Notes on my particular GPS device: The Magellan Meridian XL

As with many recent GPS devices, mine supports a choice of several serial baud rates and sets of NMEA 0183 compatible strings of fix data. Pressing SETUP on the front panel allows me to scroll through various parameter lists to select from.

Baud rates available are 1200, 4800, and 9600. Since the firmware serial port in the KPC-3 Plus supports a maximum rate of 4800, I selected 4800. I have also used the 1200 setting. Selection for you will vary depending upon the capabilities of your GPS device. Select the lowest baud rate compatible with your application.

I decided to use the NMEA "RMC" string instead of the more usual "GGA" string because my Meridian does not support checksums in the GGA string, only the RMC string. I selected RMC by scrolling down on the Setup Menu until I got the NMEA, then selected NMEA2 which included the RMC string, but not the GGA string. Selection procedure for NMEA strings for your GPS device may vary, and could include sending commands to the GPS device. If this is the case and you want to use the firmware (second) serial port of the KPC-3 Plus, you'll have to configure the GPS device first with your computer, or via the KPC-3 Plus RS-232 port, and then reconfigure the modem for GPSPORT operation (see the RPRINT command in the User's Guide).

## Operation: with a computer attached to the KPC-3 Plus serial port

At this point, my tracker was set up and running, and Magellan was properly hooked up to the firmware port of the KPC-3 Plus. An RS-232 cable connected my computer to the serial port of the KPC-3 Plus. I had a basic terminal program running. My packet MONITOR command. and monitor transmission command (MXMIT) command were on. Beaconsed RMC strings looked like this:

```
W0XI>GPS: $GPRMC,200257,A,3858.07,N,09518.09,W,00.0,000.0,040798,04,E* 5D
```

## Time and data accuracy

Finally, the 8.3 upgrade improves time and data accuracy for GPS tracker operations. If you choose, you may clear the location text buffers (LT buffers) after each beacon, verify that each NMEA (fix) string is correct before its contents are used, and verify that the time in a NMEA string is valid before using that time to update the modem's clock.

When the optional CLEAR parameter is used with the beacon location text (BL T) command, the location test buffers are cleared after each beacon. This ensures that a NMEA string placed in the buffer is not beaconsed (transmitted) more than once. If the optional CHECKSUM parameter is specified with the GPSPORT command, *only* strings with a valid checksum will be placed in the location text buffers for beaconing.

If the optional VALID parameter is used with the GPSTIME command, time acquired from a GPS string will "be used to update the KAM'98 clock *only* if the string's VALID bit is on. This ensures that the modem's software clock is accurate for applications such as slotting (timing) beacons.

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